

BRIEFING TECHNICAL PAPER CHIEF OF STAFF AND SUPERFUND DIVISION DIRECTOR EPA, REGION 4

**Florida Phosphate Mine Initiative
Region 4, Waste Management Division**

November 2007



U.S. Environmental Protection Agency



PURPOSE

- Document Region 4's assessment of TENORM at phosphate mining sites
- Summarize coordination efforts among EPA HQ, ASTDR, FDEP, and FDOH
- Propose strategy for addressing phosphate mine related CERCLIS sites

OUTLINE

- 1.0 Purpose of Technical Paper
- 2.0 Background
- 3.0 Potentially Affected Area
 - 3.1 Exposure Pathways
 - 3.2 Potentially Affected Population
- 4.0 Assessment and Evaluation Criteria
- 5.0 Federal and State Coordination
 - 5.1 EPA Headquarters
 - 5.2 ASTER
 - 5.3 State of Florida
- 6.0 Proposed TENORM Assessment Strategy
 - 6.1 Scope
 - 6.2 Community Involvement
 - 6.3 Schedule
 - 6.4 Estimated Cost
- 7.0 Recommendations

POTENTIALLY AFFECTED AREA

- 23 CERCLIS sites that total approximately 337 square miles in size
- 11 square miles of formerly mined land (non-mandatory) with residential development
- 215 square miles of formerly mined land that could be developed

ASSESSMENT & EVALUATION CRITERIA

- 5 pCi/g above background (1pCi/g) for Ra^{226} in soil (Source: UMTRCA)
- 5 pCi/l for Ra^{226} in groundwater (Source: MCL)
- 20 $\mu\text{r/hr}$ above background (6 $\mu\text{r/hr}$) for direct gamma radiation (Source: UMTRCA)

COORDINATION

- EPA HQ (OSWER, ORA, OECA)
 - Assessment and cleanup of radiation sites under Superfund
 - Assessment and cleanup criteria used by other programs
- ATSDR
 - “Observable health effects” versus “potential risk”
 - Advises on protectiveness; does not set cleanup level
 - Observable health effects level based on “minimum risk level”
 - MRL of 100 mRem/yr for radiation corresponds to approximately 10^{-3} risk level
 - EPA criteria protective, but could be higher
 - Concurred with EPA’s proposed radiation assessment strategy
- State
 - Provided GIS support in identification and location of phosphate mines
 - Insight into phosphate mining industry and role of state in regulating the industry
 - FDOH proposed tiered assessment and cleanup approach based on radiation levels less than 100 mRem/yr, 100 to 500 mRem/yr, and greater than 500 mRem/yr

PROPOSED STRATEGY

- Conduct aerial radiation survey of 23 phosphate mine related CERCLIS sites
- Conduct ground-based characterization (ESI) at individual sites based on results from survey
- Issue ESI reports and document decisions in CERCLIS for individual sites
- Evaluate PRP involvement for ESIs at individual sites
- Develop and implement communication strategy in coordination with EPA HQ, ATSDR and State

SCHEDULE

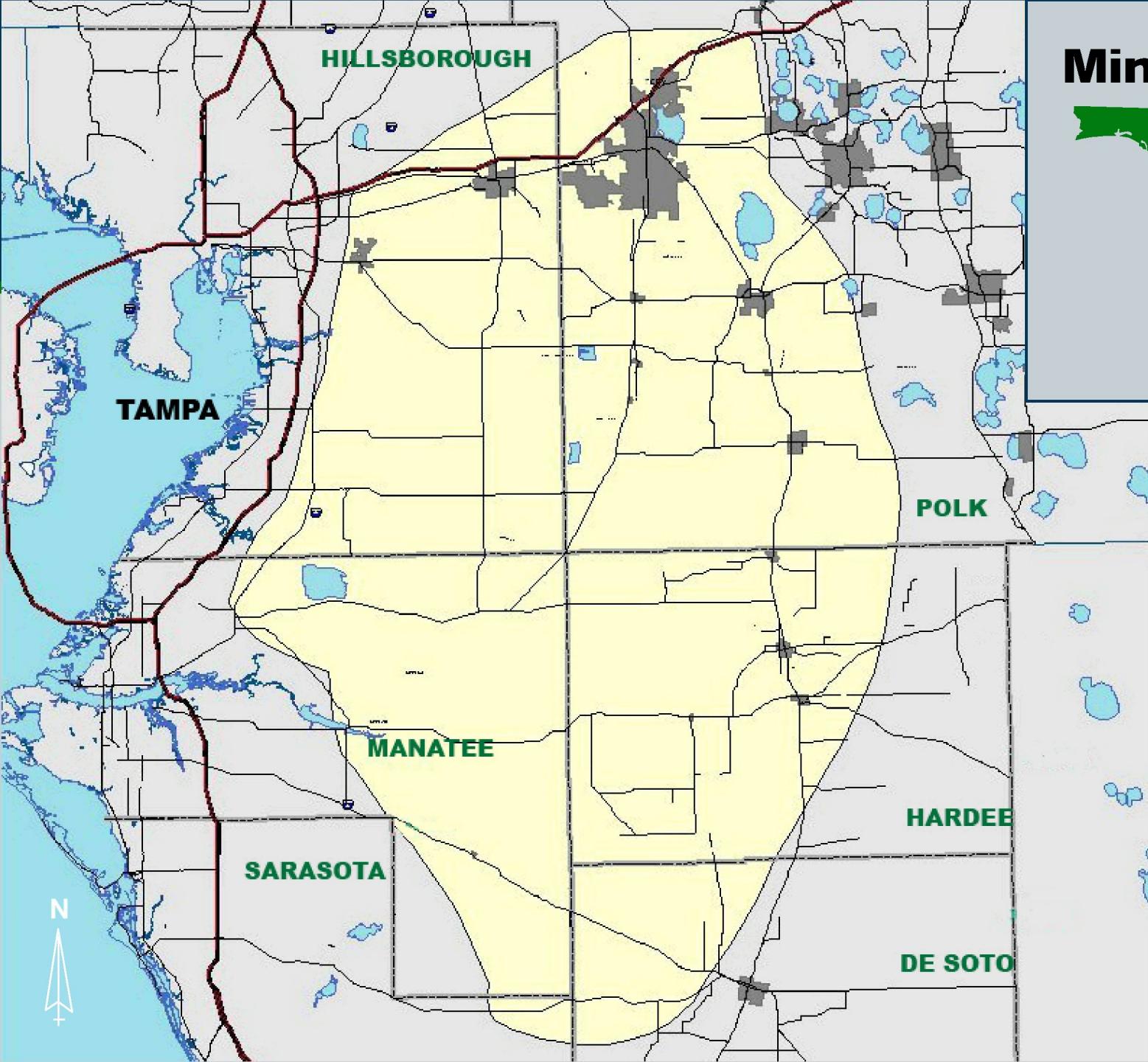
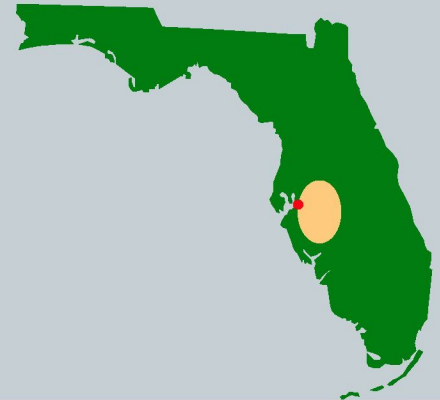
- EPA Regional and HQ Senior Management meeting fall 2007
- Governor's staff briefing fall 2007
- Draft survey Work Plan December 2007
- Draft communication strategy December 2007
- Approve WP and CI strategy February 2008
- Press release issued early-March 2008
- Radiation Survey April/May 2008
- Report September 2008

SUPPLEMENTAL INFORMATION

BACKGROUND

- Phosphate Mining conducted in West-Central Florida since late the 1800's.
- Waste by-products contaminated with elevated levels of Radium and Uranium (TENORM).
- State regulates mine operations and reclamation, but not radionuclides.
- Formerly mined land frequently developed for residential use, potentially increasing annual doses of radiation.
- 21 former mine sites in EPA inventory awaiting further characterization.
- Approximately 7,000 acres of residential areas currently located over former mines.
- EPA and State radiation data indicate potential for increases in cancer (1×10^{-3} to 1×10^{-2}) due to increase exposure to radiation.

Mining Area



Legend

- Interstates
- County Line
- Towns
- Water Bodies
- Mineable Limit
- Counties

TYPICAL MINING AREAS

Active Mining Area



Pre- & Post-Mined Area



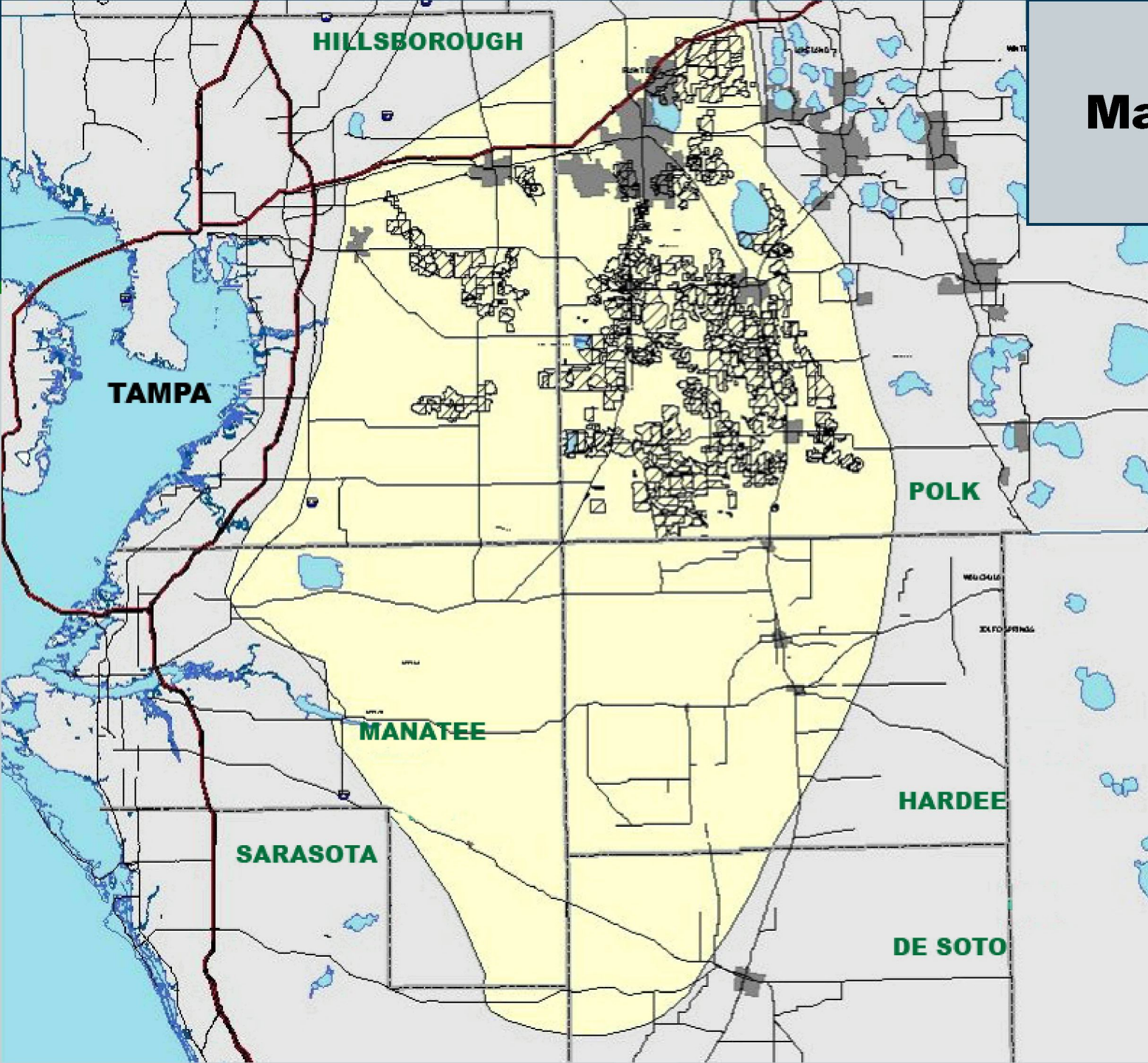
Settling Ponds



Gypsum Stack



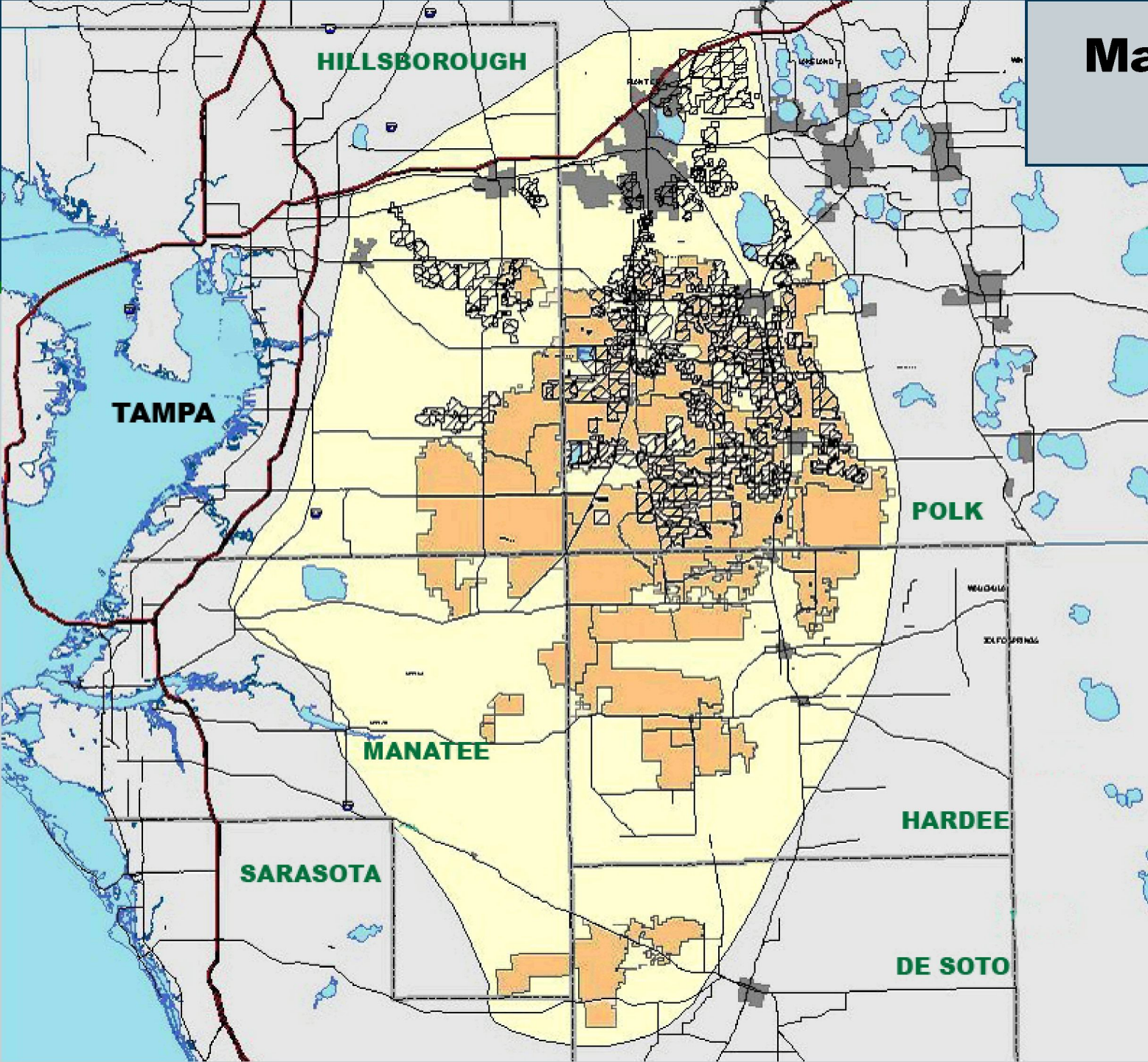
Non-Mandatory Sites



Legend

- Interstates
- County Line
- Nonmandatory
- Towns
- Water Bodies
- Mineable Limit
- Counties

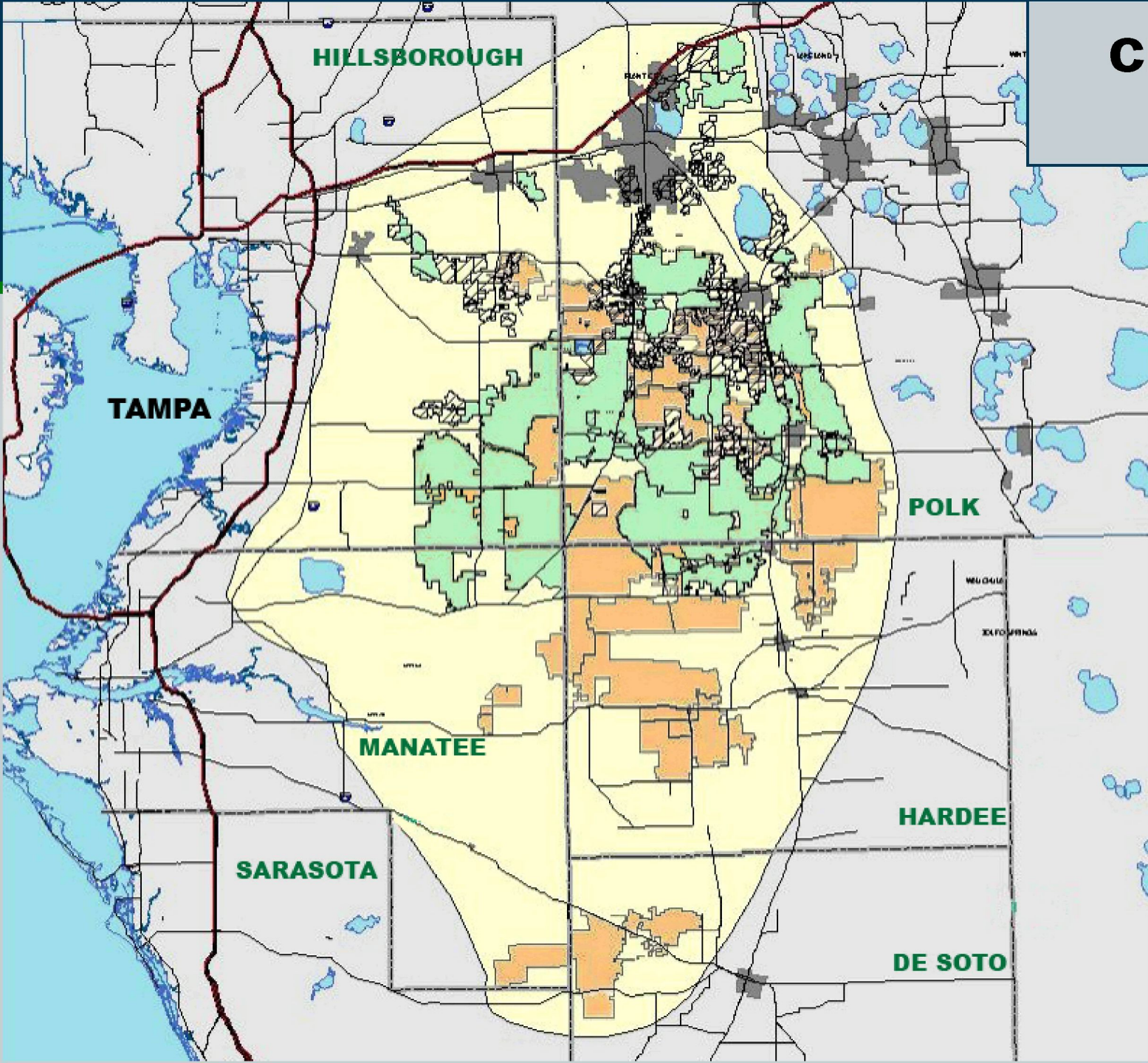
Mandatory Sites



Legend

- Interstates
- County Line
- Nonmandatory
- Towns
- Water Bodies
- Mandatory Mines
- Mineable Limit
- Counties

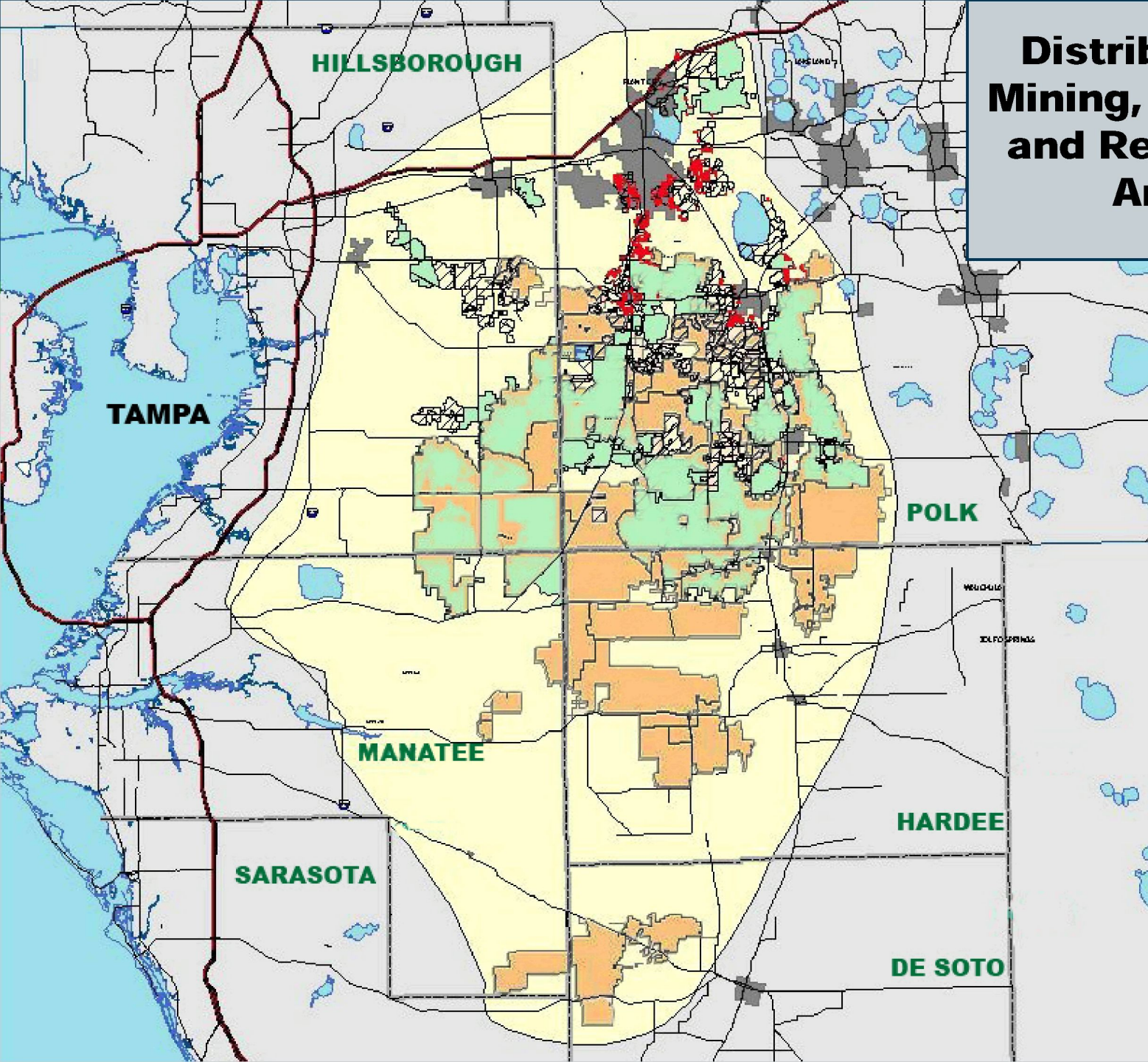
CERCLIS Sites



Legend

- Interstates
- County Line
- Cerolis Mining Sites
- Nonmandatory
- Towns
- Water Bodies
- Mandatory Mines
- Mineable Limit
- Counties

Distribution of Mining, CERCLIS, and Residential Areas

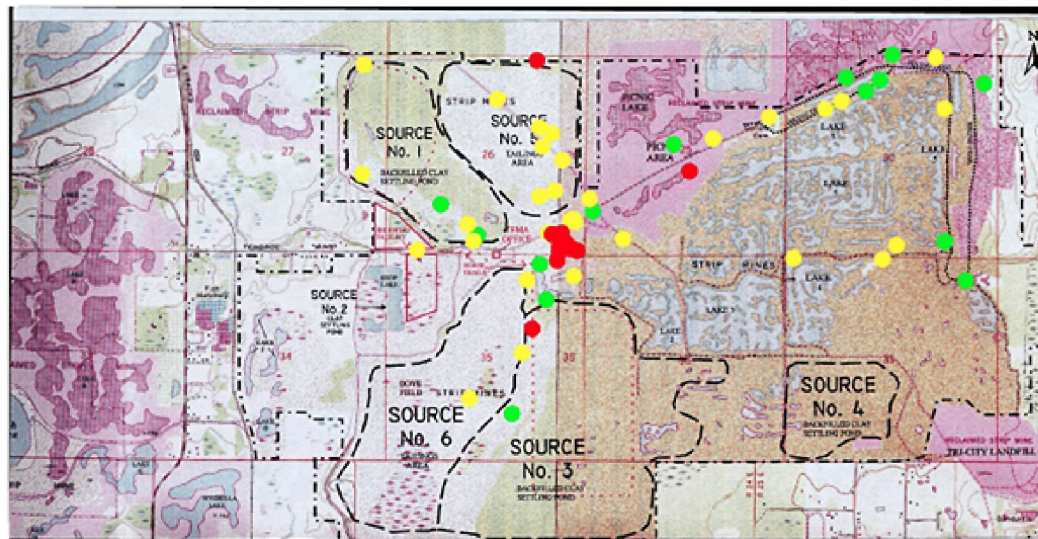


Legend

- All Mines Intersection
- Cerclis Intersection
- Nonmandatory
- Interstates
- County Line
- Cerclis Mining Sites
- Nonmandatory
- Towns
- Water Bodies
- Mandatory Mines
- Mineable Limit
- Counties

EPA RADIATION DATA UNDEVELOPED MINE

BORDEN CHEMICAL COMPANY / TENOROC MINE RADIATION MEASUREMENT LOCATIONS



Legend

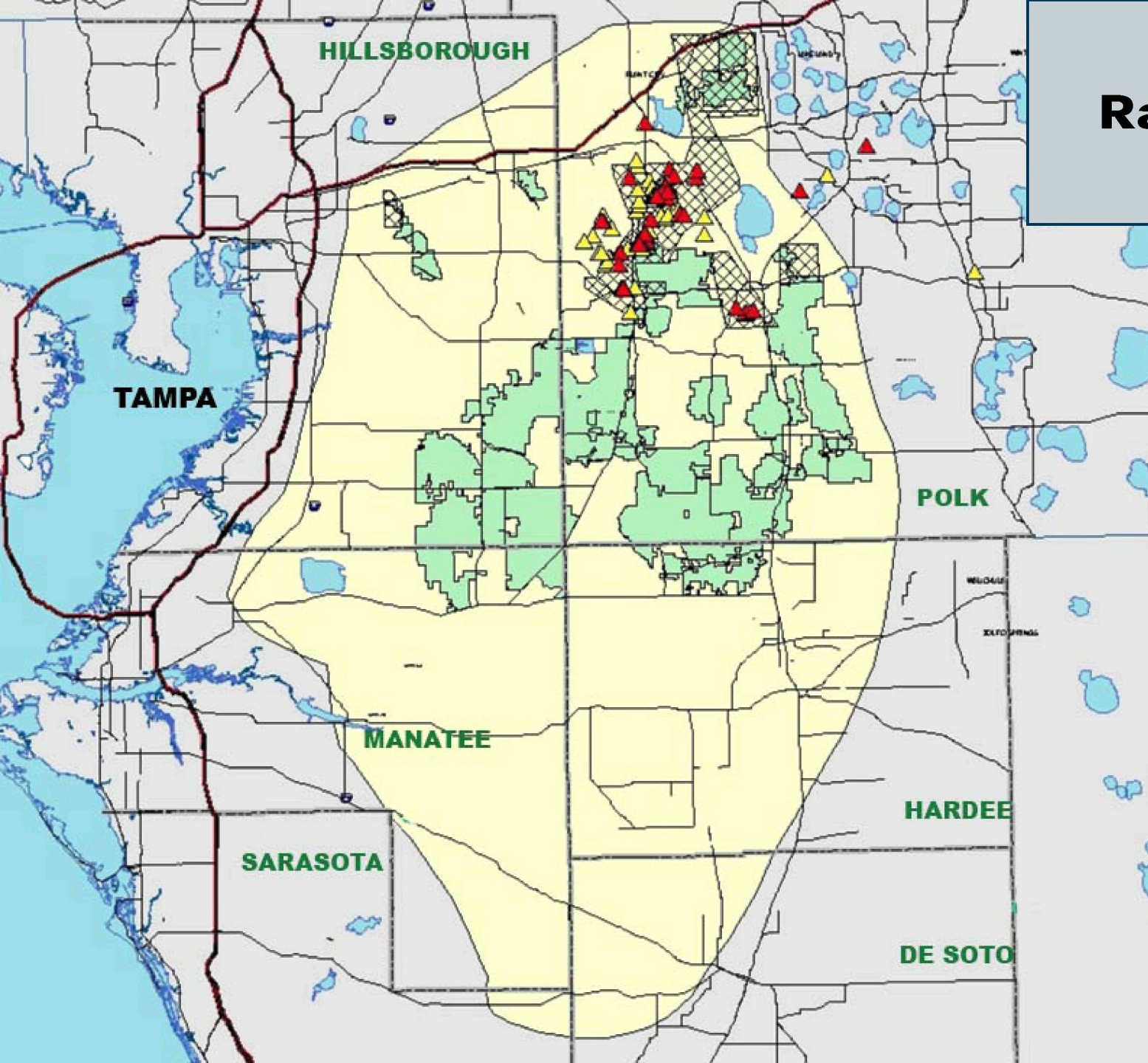
- < 15 mRem/yr
- > 15 and < 100 mRem/yr
- > 100 and < 500 mRem/yr
- > 500 mRem/yr
- Site Boundaries
- Source Areas

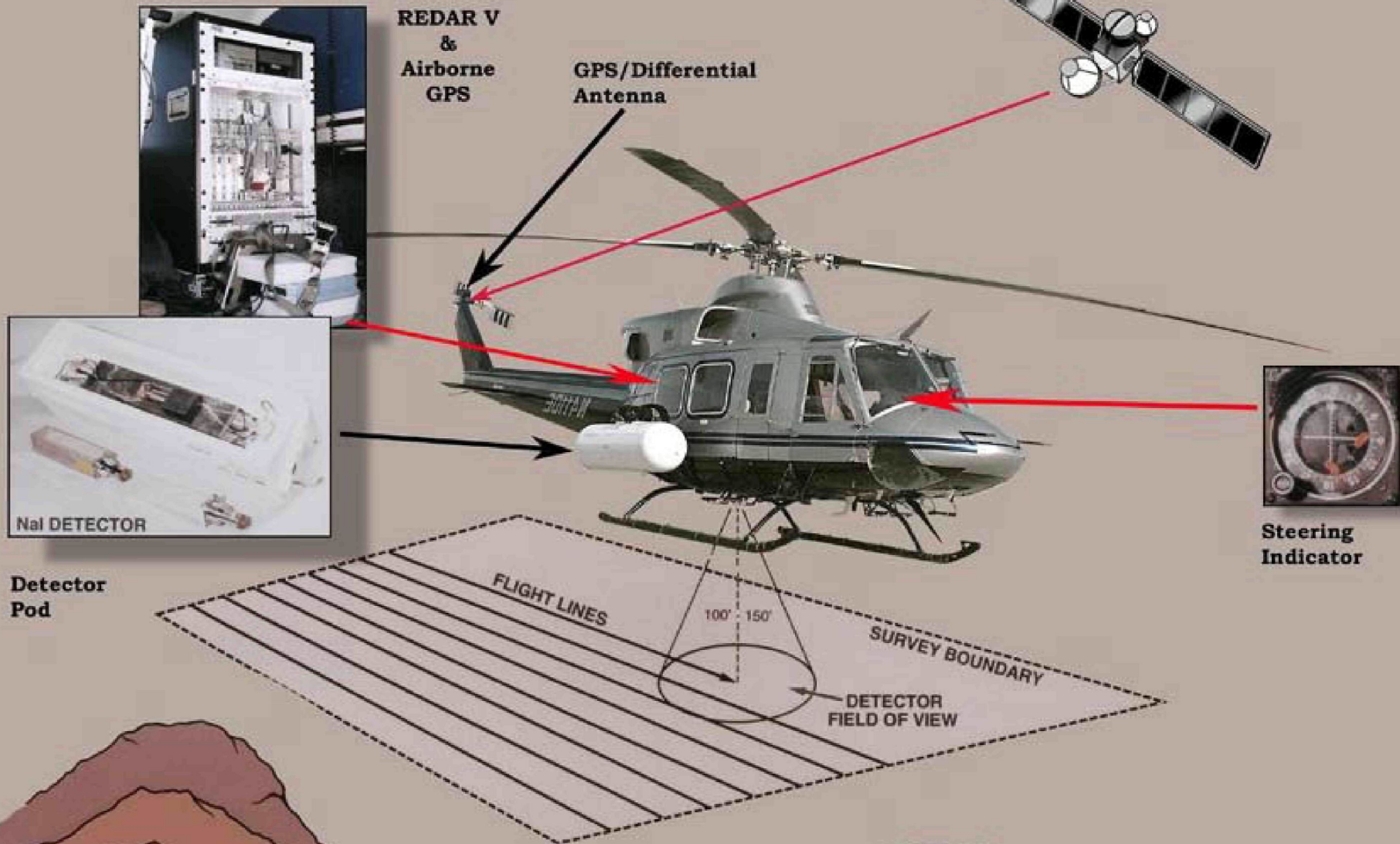
Map Scale



This map is an adaptation of Fig. 1 in the report of July 25, 2009 prepared for the U.S. EPA by Tetra Tech TM Inc.

State Radiation Data





Radiation Survey Method

CURRENT PHOSPHATE MINING COMPANIES & CURRENT/FORMER OWNERS OF SAMPLING OF CERCLIS SITES AND DEVELOPED AREA

- **CURRENT MINING COMPANIES**

- CF INDUSTRIES (MID-WESTERN CO-OP)
- MOASIC (FORMERLY CARGILL AND AGRICO)
- PCS PHOSPHATE (CANADIAN COMPANY)
- USAC (CHINA BASED COMPANY)

- **CERCLIS SITES CURRENT/PAST OWNERS/OPERATORS**

- AGRICO; WR GRACE; IMC; CARGILL; AMERICAN CYANAMID; KERR-MCGEE; SEMINOLE FERT.; AMAX; CORONET; BORDEN; FARM LAND IND; ESTECH; SWIFT AGRICULTURAL

- **CHRISTINA BLUFFS RESIDENTIAL AREA**

- W.R. GRACE ORIGINAL OWNER
- MULTIPLE INDIVIDUAL AND BUSINESS OWNERS
- CURRENTLY OWNED BY INDIVIDUAL RESIDENTS